Strategy Research Project

U.S. SPACE POLICY AND SPACE INDUSTRY STRANGULATION

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U.S. SPACE POLICY AND SPACE INDUSTRY STRANGULATION

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This Strategy Research Project (SRP) explores United States Space Policy by discussing its past and current state, outlines the effects of it on national security and the space industry, and provides recommendations to improve our management of space as a vehicle of national security and engine for economic growth. It contrasts the competing requirements of a "close hold" position for information, materials and materiel to protect national security and the broader need for sharing those resources to successfully compete in the globalized space industry. The SRP also explores the effects of U.S. Export Control Acts on the U.S. space industry and discusses the global dispersion of educated and talented human capital on the U.S. ability to compete in the global market. Recommendations include a restructuring of U.S. government to ensure a balanced emphasis on national security and economic health, reducing export restrictions in recognition of the need to compete globally, while still protecting U.S. national security, and creating an environment in which non-U.S. citizens can participate fully in the U.S. space industry.

U.S. SPACE POLICY AND SPACE INDUSTRY STRANGULATION

U.S. Space policy must balance three competing demands; national security, economic development in the space industry, and recruiting and developing talented people to support and advance the Nation's pre-eminent position as the world leader in space. First and foremost is national security. Space must not become a base from which freedom can be threatened and it must be accessible to allow for the positioning of systems which enhance the U.S. national security. This means that technologies that are vital to national security must be safeguarded. Safeguarding technologies, however, can have the negative effect of driving innovators from the market, if it is restricted in such a manner that economic benefits cannot be realized by those who assume the considerable risk in research and development costs. Safeguarding, by its very nature, restricts markets which technologies can be sold. The fundamental problem becomes a balance between national security, and creating and sustaining a globally competitive space industry. These realms are not mutually exclusive. If technologies are overly guarded and profits cannot be realized, then innovators will choose other markets and development of U.S. space related technologies will atrophy. There is an opportunity cost in this atrophy as U.S. technology development will not occur, or will lag behind other nation state competitors. The third consideration to the balance between national security and market development is its effect on recruitment and retention of quality personnel into the U.S. space industry. If the industry, or market, is not healthy, then talented personnel will choose to work in other industries thus exacerbating the lack of technology development and the lag behind nation state

competitors. It is within this tensional environment that an effective space policy must be written and executed.

This paper reviews U.S. space policy history and examines the effects of the Arms Control Export Act of 1976, United States Munitions List, International Traffic in Arms Regulations and the shift of human capital on U.S. national security and the U.S. space industry.

The First Vision

The United States has been the leader in space since early 1961. President John F. Kennedy, in a speech before a joint session of congress, set the country on a course to "send an American safely to the Moon before the end of the decade".[1] This goal was set in reaction to recent U.S. failures to successfully launch a vehicle into space, and surpass Soviet Union manned spaceflight successes. Kennedy wanted the U.S. to "catch up and overtake the Soviet Union in the space race".[2] The U.S accomplished that goal quickly and pressed the point home on July 20, 1969 when Apollo 11 commander, Neil Armstrong stepped off the Lunar Module's ladder and on to the moon's surface.[3]

The intent of the space program was not merely to place mankind on the moon. It had broader and more earthly goals. Kennedy, in a speech given in 1962 at Rice University, outlined three primary goals (national security, economic and educational) in terms that are still discussed, and are in contention, today. He viewed space as a vital part of our national interest and compared it to the open seas noting "whether it will become a force for good or ill depends on man, and only if the United States occupies a position of pre-eminence can we help decide whether this new ocean will be a sea of peace or a new terrifying theater of war".[4] Kennedy further vowed that " we shall not

see space filled with weapons of mass destruction, but with instruments of knowledge and understanding."[5] But in space, he also saw immense education and economic opportunities for the Nation. In the same speech he envisioned that the "growth of our science and education will be enriched by new knowledge of our universe and environment".[6] Finally, he recognized the economic impact of creating a market for space related endeavors by noting that "the space effort itself, while still in its infancy, has already created great number of new companies, and tens of thousands of new jobs, and that space and related industries are generating new demands in investment and skilled personnel". [7] In this single speech, Kennedy first defined the tri-polar nature of the space program and its guiding policies. Since the heady era of the Apollo program, other successful programs followed. With Skylab, the Space Shuttle Program and International Space Station, the U.S. has used space effectively to enhance its national security. It has also developed an enviable record in space industry development, dominated the market for space related products and services, and recruited, educated and employed a vast workforce in support of its interests in space. But, as in all markets, dominance is a transient state. A slipping market share, shrinking workforce, and foreign technological innovation since the late 1990's have been evidence of the ebb in U.S. space leadership.

Vision for Space Exploration Program

In January of 2004, President Bush announced his Vision for Space Exploration (VSE) Program as an attempt to refocus and reenergize the U.S. space program. The vision embraced and committed the U.S. to a long-term human and robotic program to explore the solar system, starting with a return to the moon with the intent that it be used as a base for exploration of the solar system.[8] It also affirmed the nation's

commitment to manned space exploration and gave the National Aeronautics and Space Administration (NASA) a new focus and clear objectives while recognizing the benefits of space technology which yielded advances in communications, weather forecasting, electronics, and countless other fields.[9]

This vision was dramatic in scope but its effect was to narrow the space program to one single focus, human space flight. Among other problems with this vision, the primary was insufficient funding. "As the saying goes, vision without funding is a hallucination,"[10] and at the time the vision was presented there were no cost estimates for returning to the moon and beyond. The President committed $12 billion for space exploration over five years but most of that came from reallocation of $11 billion from within the NASA budget of $86 billion for the five out years. Additionally the President added an additional $1 billion spread over the next five years or $200 million a year.[11] The cost of putting men on the moon with the Apollo program was $135 billion in 2004 dollars.[12] The effect of this underfunding was the migration of funds from other programs within NASA to support the VSE. This caused NASA to go from a multifaceted agency that was engaged in science, aeronautics and space exploration to one simply of space exploration.[13] In turn, this reduced the numbers, and thus benefits, of spin-off technologies that were trumpeted in the inception of the VSE. The problem was exacerbated by delays and cost overruns of the Constellation Program (program developed to get the U.S. to the moon) which drew more funding from other programs. It also lacked commitment from the President. After announcing this vision, President Bush never mentioned it again.[14] Today, the whole Constellation Program is in jeopardy

of cancellation as President Obama's budget submitted to Congress removes funding for the program, representing billions of dollars wasted.

While the vision was helpful in focusing the U.S. space effort, there still lacked a defined and updated space policy which would guide the nation in some of the broader issues of space, namely, U.S. national security and economic strength in the space sector. An attempt to rectify this was made by the publication, in 2006, of an unclassified U.S. National Space Policy.

Current Space Policy

The unclassified U.S. National Space Policy was authorized, by then President Bush, on 31 August, 2006.[15] (While the current administration has the policy under review, and its 2011 budget gives a clear indication of a trend towards commercialization, it remains the policy in effect at the writing of this paper.) Therein, the President defines the principles and goals of U.S. space policy and applies them in three fundamental areas: National Security Space Guidelines, Civil Space Guidelines, and Commercial Space. Defined in these areas are the nation's interests and the responsibilities of various agencies within the United States Government (USG). Also addressed in the policy are: International Space Cooperation, Space Nuclear Power, Radio Frequency Spectrum and Orbit Management and Interference Protection, Orbital Debris, Effective Export Policies, and Space-Related Classification.

The policy lists seven guiding principles for the space programs and activities and is defined as an effort which "shall be given top priority". These guiding principles in brief are:

- Commitment to the exploration and use of outer space by all nations for peaceful purposes, and for the benefit of all humanity.

- Rejection of any sovereignty claims over outer space by any nation and any limits on the U.S. right to operate in and acquire data from space.
- Cooperation with other nations in the peaceful use in outer space to extend the benefits of space exploration, and to protect and promote freedom around the world.
- Recognition that space systems have the rights of passage through and operations in space without interference, and views any purposeful interference with its space systems as an infringement of its rights.
- Identifies space capabilities, to include ground stations and space based supporting links, to be vital to U.S. national interests and accordingly will preserve its rights, capabilities, and freedom of action in space, dissuade or deter others from either impeding those rights or developing capabilities intended to do so, take those actions necessary to protect its space capabilities, respond to interference, and deny adversaries the use of space capabilities hostile to U. S. national interests.
- Opposition of the development of new legal regimes or other restrictions that seek to prohibit or limit U.S. access to or use of space.
- Commitment to encouraging and facilitating a growing and entrepreneurial U.S. commercial space sector.

Derived from the seven guidelines are seven distinct space policy goals. These goals are mainly focused on enhancing national interests and national security. Following is a brief description of these goals:

- Strengthen the nation's space leadership and ensure that space capabilities are available in time to further U.S. national security, homeland security, and foreign policy objectives.
- Enable unhindered U.S. space operations to defend our interests there.
- Extend the human presence across the solar system through robotic and human exploration.
- Increase the benefits of civil exploration, scientific discovery and environmental activates.
- Enable globally competitive domestic commercial space sectors, leadership, and protect national, homeland and economic security.
- Enable a robust science and technology base supporting national security, homeland security and civil space activities.
- Encourage international cooperation with foreign nations and/or consortia on space activities that are of mutual benefit and that further the peaceful exploration and use of space, as well as to advance national security, homeland security and foreign policy objectives.

A quick scan of the principles and goals listed above shows an overriding emphasis on national security. Within the seven guiding principles five address national security, one is of a political nature and one is economic. The seven goals are more broadly focused with two distinct national security goals, two political and three economic though they have national security/interest caveats. While the policy addresses and supports economic growth through an entrepreneurial, globally competitive domestic commercial space sector, the application of it belies its intent.

Export Control, Regulations and Lists

A portion of the policy, specifically the national security intent, is strongly impacted by the Arms Export Control Act of 1976. Also, because it regulates import and export of goods and services, it affects the economic intent of the policy. The Act is listed in Title 22 of the United States Code and gives the President control of the import and export of defense articles and defense services.[16] The President is further authorized to designate items which are considered as defense articles and defense services. These articles constitute the United States Munitions List.[17] The United States Munitions List (USML) is also found in Title 22 of the United States Code.[18] Within the USML space related items are found in Category XV – Spacecraft Systems and Associated Equipment and in Section 121.16 – Missile Technology Control Regime Annex. The application of the Arms Export Control (AECA) Act is regulated by the International Traffic in Arms Regulations (ITAR) which is also found in Title 22 of the United States Code. These acts, regulations and lists not only control initial sale of goods or services but also restrict retransfer. In other words, the export authorizations include language that precludes the goods or service from being further transferred to a third country or to a national of a third country except as specifically authorized in the original agreement unless the State Department has given prior approval.[19] This means that the given technology or service must be controlled and accounted for through its entire life cycle by the entity that was issued the original license to export. The regulations also apply to foreigner's access to technologies while they are attending U.S. universities or employed by U.S. firms.

The ultimate goal of this body of regulatory activity is to prevent sensitive defense materials, materiel and technologies from being procured or transferred to potential advisories who then can, in turn, use them to threaten U.S. national security. [20]

Critics, mainly from the defense industry, have found it an impediment to competing effectively on the global market. In particular, the USML is targeted as being outdated, containing many items which are no longer exclusive to the United States, and containing items that no longer need control. Critics also cite the onerous requirements for gaining a license which causes them to lose business to overseas competitors.[21] An example of this is encryption technology. Originally the sole realm of national security and defense applications, encryption now has entered the broader civilian market with no ties to defense or national security, yet U.S. software manufacturers must gain licenses through the Department of State, regardless of the application, because encryption is still listed in the USML. Since encryption is listed on the USML, and thus regulated by ITAR, U.S. encryption software manufacturers are at a competitive disadvantage in the global market.[22] Proponents of the body of regulations are from the national security and arms control arena and claim that loosening of the regulations could degrade U.S. national security and prove deadly. If the past is any indication they might well be correct. During the Clinton administration many items which were considered dual use (military/civilian) were reviewed and control of these items was transferred from Department of State under the USML, to the Department of Commerce.[23] After significant technology transfers to the People's Republic of China (PRC) through joint ventures, front companies and outright theft was discovered subsequent to transfer of control, Congress formed the House Select Committee on

U.S. National Security and Military/Commercial Concerns with the People's Republic of China to review the situation. Among the thirty eight recommendations put forth by the Committee were several tightening technology licensing and export control laws.[24] An era of tighter export regulations, and in particular enforcement of the regulations, was introduced. In fact, prior to 1999 the Department of State had issued only 11 consent agreements (charges) in the period between 1978 and 1998, and from 1999 to 2010 it has issued 33 consent agreements.[25] Most recent consent agreement (2010) is a million dollar penalty applied to Interturbine Aviation Logistics, Gmbh (a German company) and its Texas subsidiary for knowingly circumventing its own procedures and those of ITAR by shipping 400kg of DC 93-104 ablative material from its Texas location, to its headquarters in Germany and subsequently to a third party in Germany without proper export licensing.[26]

Effect on Industry

The Arms Export Control Act, International Traffic in Arms Regulations and the United States Munitions List are comprehensive, though very general in nature, leading the defense industry to describe them as complicated, costly and constrictive controls.[27] Implemented during the cold war, these control measures were designed to protect U.S. national security against the singular threat of the Soviet Bloc countries.[28] Much of that threat was in the form of technology advancement as the two countries sought to gain an advantage. The arms race is an example of this as not only the number of arms was a metric, but the sophistication, deadliness and level of technology of the weapon systems were also a factor. Clearly, an advanced and vibrant high technology industry, producing weapon systems more advanced than the other country, would be of great advantage. Control of sensitive technologies is paramount in this environment. In the

context of a bi-polar world the foundation for arms export control was built. Globalization, the end of the cold war, increased technological sophistication of other countries, and the diffuse nature of the threats to our national security are the hallmarks of the current world order. The problem is that the world has changed but U.S. regulatory body has not.

The USML is of particular concern to industry as it not only pertains to items which are clearly designed for military purposes but it also controls more common items such as rivets, wires and bolts.[29] The effect of this is to reduce the agility of the defense industry as it tries to compete in the global market and frustrates would-be purchasers of U.S. goods because of long lead times and bureaucratic processes. An effect of this is the development and marketing of "ITAR Free" products by other Nations.[30] In the end, the market is driven away from U.S. suppliers and driven into the arms of foreign competitors. Another concern of the industry has been the length of time it takes for approval and license issuance under ITAR. For example, Congress must approve or reject a request to export a satellite because these systems exceed cost thresholds for mandatory Congressional review. By law the approval or rejection must occur within 30 days of the requests however, submission usually does not occur until all questions have been answered. Delays have also been experienced at the Departments of State and Commerce with some requests taking over ninety days to determine issuance of a license.[31]

The cost of complying with U.S. export control regulations carries a high price for U.S. companies. It is estimated that the total cost to U.S. space industry companies is $49 million per year industry wide and grew a staggering 37% during the 2003 to 2006

timeframe.[32] This is money not easily parted with for an industry that reports running between 2.5% and 5% net profit margin for operations.[33] Also consider the opportunity cost of lost business because foreign consumers are not willing to wait for license approval to use ITAR restricted materiel. This cost is estimated at $600 million a year.[34]

Another partial indicator of the effect of export control is the growing trade imbalance in the high technology goods market. From 1995 to 2008 the U.S. imported $75 billion dollars more in high technology goods then it exported while exports from China and other Asian countries to the U.S increased.[35] Globally, high technology exports, as a share of production, rose 18% from 1995 to 2008. The U.S. experienced a 14% drop in high technology exports during the same period indicating a dramatic shift in the high technology economic base.[36]

Acutely affected has been the U.S. commercial satellite manufacturing and service sector as the U.S. is the only country that manages its commercial communications satellite industry as munitions.[37] In the years since export control was tightened in 1999 the U.S. commercial satellite industry as seen a significant drop in market share. While world satellite industry revenues have grown 14.2% for the period from 2003 to 2008 and totaled $144.4 billion in 2008, revenues of U.S. companies have declined.[38] In the area of satellite manufacturing, U.S. share of the market has fallen from 47% in 2003, to 29% in 2008, and U.S. share of launch revenues has fared even worse dropping from 66% in 2003, to 28% in 2008. Particularly troubling in the launch revenues is that while the world market saw a growth of revenues of 31% ($1.2 billion in growth) between 2006 and 2008, the U.S. share remained flat with a growth of revenues of only .1% ($1 million).[39] These numbers indicate that the world satellite

industry has overtaken and surpassed U.S. companies in these markets. For an industry once dominant in these markets this has come as a significant blow. The market shift also indicates a technology base shift to other countries that has reduced the U.S. national security leaving the country vulnerable. In the past, innovative and advanced space technologies that could be applied as such, or spun out to other applications, were under the purview of the U.S. simply due to the fact that the U.S. space industry developed these technologies. Many of these new technologies had a direct effect in enhancing U.S. national security. The space based Global Positioning System (GPS) is an example. Presently, however, the shifting of the high technology market to other countries, which includes human capital, means that innovative and advanced technologies will be developed outside of U.S. control and can be applied in a manner that leaves the country vulnerable. Will the next innovative technology, the next GPS, come from within or without the U.S.?

Effect on Human Capital

The regulatory requirements have also had a negative effect on the pool of human capital available in the U.S. for research and development. For many of the same reasons that materiel was controlled (the ongoing cold war), human capital and intellectual capital are also regulated. In this area the world has experienced great change. As with technology, the regulatory requirements have not changed to meet the requirements of the modern world.

Traditionally, the United States had to worry about science and technology flowing out of the country. Today, the U.S. has to be concerned about keeping science and technology flowing into the country.[40] As other countries, India and China for example, experience increased economic growth; investment is made in its human

capital. This includes world class schools with advanced curriculua in science and technology. In these, and other emerging countries, a world class education system, coupled with a viable industrial base to provide jobs, and a broadening middle class and upper middle class, makes staying near family, hearth and home an attractive option to studying, working and living in the U.S.. The result is that talented human capital remains home instead of emigrating to the United States.[41]

U.S. space policy, implemented through the AECA and ITAR, has impeded the flow of human capital into the U.S. space industry. Because ITAR restricted information can only be accessed by U.S. citizens or shared with foreign citizens through the licensing process (information is treated like an export), hiring talented foreign scientists and engineers is problematic. Compounding the problem is the fact that licenses are granted for specific information and projects and sharing of information across projects, even in the company, is forbidden unless further licensing is obtained. Limits placed on the number of H1B1 Visas, those used for non-immigrating persons with specialty skills who want to work in the U.S., reduce the overall pool available and exacerbate the problem.

The reason this is a major problem for the U.S. is because there are not enough U.S. citizen engineering students to support projected growth in the industry. The U.S. Bureau of Labor Statistics is predicting an 11% increase in space related engineering positions between 2006 and 2016.[42] These are new positions and the prediction does not take into account retirements from an aging workforce with approximately 58% of the workforce over 50 years of age. Lockheed Martin has indicated it will need 140,000 engineers over the next ten years just to cover engineer retirements.[43] While enrollment

for baccalaureate engineering degrees at U.S. universities in 2008 is primarily U.S. students (94%), foreign students enrolled in masters programs make up almost half the population (43%), and are over half for doctoral programs (52%).[44] Trends from 1999 to 2007 for engineering baccalaureate degrees awarded are fairly flat running between 91% and 94%. The U.S. student to foreign student ratio for masters programs shows a downward trend from 2000 to 2004 but recovered by 2007 to just 1% higher than 1999 at 61%. U.S. student doctorial degrees awarded have experienced a significant and sustained downward trend from 1999 to 2007 with a 16% decline over that period.[45] This indicates a reduced pool of available U.S. engineers with doctorial level education to drive innovation within the industry.

Two disturbing trends that point to a dilution of the U.S. high technology intellectual base are found in authorship of science and engineering articles and the U.S. share of patent grants issued by the U.S. Authorship, or in this case co-authorship of U.S. science and engineering articles between U.S. and the international community has increased by 27% from 1988 to 2007.[46] Indeed, this is a two sided coin that clearly shows greater international cooperation, which is welcomed, but it also shows the U.S. science and engineering community not having the resources to author articles independent of the greater international community. Similarly, the U.S. share of U.S. patent grants has been on the decline from 1995 to 2008 dropping by 7% during that period.[47] The number of patent grants obtained by an individual or corporation is an indication of successful and marketable innovation. The drop for the U.S. and corresponding rise in U.S. patent grants for Asian countries is another indication of shifting intellectual capital.

It is clear that to sustain growth and fill expected engineering positions that the U.S. will have to depend on talented and specialized foreign human capital. Unfortunately, due to a globally broadened technology base and an expanding middle and upper middle class in many of the countries from which these foreign workers hail, the U.S. might be at a competitive disadvantage. In other words these workers will opt to work at home. Access to information, feeling of being part of a team, the ability to work in a desired discipline or on a desired project will all be factors in the individual decision of where to settle and start or continue careers. AECA, USML and ITAR all work against the U.S. in that they restrict access to information and the ability to work on desired projects because of a perceived threat to national security.

Policy Review: A History of Inaction

The decline of U.S. national security and U.S. space industry outlined above occurred, for the most part, from the late 1990's to present. The government cannot be accused of insufficient "due diligence" in terms of identifying the problem or in obtaining suggested solutions to prevent the slow decline. The government, however, did not act on the clear signs emanating from statistical evidence, or on the recommendations of the commissions and studies, both government mandated and industry funded, that highlighted the threat to the nation. In short the U.S. government was aware of the problem but did practically nothing towards a resolution.

The Commission to Assess United States National Security Space Management and Organization was established by the National Defense Authorization Act for Fiscal Year 2000. The Commission examined the role of organization and management in developing and implementing national-level guidance and in establishing requirements, acquiring and operating systems, and planning, programming and budgeting for national

security space capabilities. The review concentrated on intelligence and military space operations as they relate to the needs of the national leadership as well as the needs of the military in conducting air, land and sea operations and independent space operations.[48] The final report was submitted to Congress on 11 January, 2001. In it, the Commission recommended an early review and, as appropriate, revision of the national space policy. It would be five years until this was accomplished with the release of the 2006 national space policy.

Reasons for this recommended revision included promotion of government and commercial investment in leading edge technologies to assure that the U.S. has the means to master operations in space and compete in international markets.[49] This showed clear understanding, in 2001, of the shifting technology base to a more globalized environment, and the importance of competition in international markets. The Commission also recognized the importance of human capital in its report indicating the government needs to play an active, deliberate role in expanding and deepening the pool of military and civilian talent in science, engineering and systems.[50] More direct to the point, the Commission, in recognizing that the quality of human capital cannot be taken for granted and is tied directly to national security, it opined that sustained excellence in the scientific and engineering disciplines is essential to the future of the nation's national security space program.[51] In addressing the commercial space industry, the Commission noted that the U.S. Government has no comprehensive approach to incorporating the U.S. commercial and civil space sectors to the successful completion of the national security mission,[52] and goes on to point out that the "U.S.

Government, as a consumer, a regulator or an investor, is currently not a good partner to the national security space industry".[53]

The Commission's conclusions identify the rapidly growing U.S. dependence on space and that this dependence is creating vulnerabilities. It also recommends that U.S. national security space interests are recognized as a top national security priority.[54] It also reiterates investment in human capital is essential for the U.S. to remain the world's leading space-faring nation and the need to sustain its investment in enabling and breakthrough technologies in order to maintain its leadership in space.[55] No discernable action was taken in the ensuing years on report recommendations and in 2008 another report was commissioned by Congress.

The 2008 study was compiled by a similarly named "The Independent Assessment Panel on the Organization and Management of National Security Space".[56] The Independent Assessment Panel (IAP) was chartered to review and assess the DoD management and organization of national security in space and make appropriate recommendations to strengthen the U.S. position.[57] The charter is also very similar to the previous Commission's, and made many of the same recommendations. In its opening memorandum to Senator Levin, the IAP is very pointed about the importance of space and that U.S. leadership in space provides a vital national advantage across the scientific, commercial and national security realms.[58] In very direct language, and with a unanimous voice, the IAP stated that without significant improvements to the leadership and management of national security space programs, that U.S. space preeminence will erode to the extent that space ceases to provide a competitive national security advantage.[59] It's very first recommendation was that the government establish and

execute a national space policy.[60] Further recommendations include organizational changes and relaxing aspects of ITAR, finding that ITAR restrictions have had a counterproductive effect on U.S. space competitiveness and have not effectively limited the proliferation of space technologies, or the access of foreign firms to competitive space technologies. Since these parallel the recommendations of the 2001 Commission, one can divine that little was done in the seven years between reports, a period that witnessed a significant decline of U.S. leadership in space.

Recommendations

The grand strategic intent of the space export controls is not being achieved and despite the strong handed control over the industry by the AECA, USML and ITAR it has not prevented the rise of competitive foreign space industries but in some cases has assisted in that growth.[61] Therefore a complete and comprehensive change in how the U.S. views its role in space, its leadership and management of that role, the funding required to make its view a reality, and management of national security issues is urgently needed. The U.S. government especially needs to re-think what actions are in the best interest of national security and realize that exclusive policies may be more harmful, in the long term, than inclusive policies.

The good news is that the answers are already there. Two of the most current studies of the issue offer an excellent way forward. Echoing each other they call for several changes. First, a coherent, executable, and holistic national space policy that gives the nation a clear path forward must be published. Second, there must be a structural change within the U.S. government which creates one entity responsible for the oversight and execution of the policy across the whole of government. Third, the AECA, USML and ITAR must be reviewed and updated to meet the realities of

globalization. Fourth, the U.S. must broaden its intellectual and manufacturing base by adopting a globally inclusive policy that still protects U.S. national security. Fifth, the U.S. must recognize that technologies have a shelf life, and do not have an effect on national security for an indefinite period. Sixth, constraints on human capital which make the U.S. an undesirable workplace must be lifted. Finally, technologies, material and materiel that have a clear and direct impact on U.S. national security must be safeguarded.

U.S. Space policy has been described as a "paradoxical picture of high ambition and diminishing commitment".[62] This diminishing commitment manifests itself in the degradation of U.S. leadership, and capabilities in space and has tangible and very human implications.

In 2005 LT Michael P. Murphy was killed during "Operation Redwing". For his actions he received The Medal of Honor. The citation for LT Murphy reads:

> For conspicuous gallantry and intrepidity at the risk of his life above and beyond the call of duty as the leader of a special reconnaissance element with naval special warfare task unit Afghanistan on 27 and 28 June, 2005. While leading a mission to locate a high-level anti-coalition militia leader, lieutenant Murphy demonstrated extraordinary heroism in the face of grave danger in the vicinity of Asadabad, Konar Province, Afghanistan. On 28 June 2005, operating in an extremely rugged enemy-controlled area, Lieutenant Murphy's team was discovered by anti-coalition militia sympathizers, who revealed their position to Taliban Fighters. As a result, between 30 and 40 enemy fighters besieged his four-member team. Demonstrating exceptional resolve, Lieutenant Murphy valiantly led his men in engaging the large enemy force. The ensuing fierce firefight resulted in numerous enemy casualties, as well as the wounding of all four members of the team. Ignoring his own wounds and demonstrating exceptional composure, Lieutenant Murphy continued to lead and encourage his men. When the primary communicator fell mortally wounded, Lieutenant Murphy repeatedly attempted to call for assistance for his beleaguered teammates. Realizing the impossibility of communication in the extreme terrain, and in the face of almost certain death, he fought his way to open terrain to gain a better position to

> transmit a call. This deliberate, heroic act deprived him of cover, exposing him to direct enemy fire. Finally achieving contact with his headquarters, Lieutenant Murphy maintained his exposed position while he provided his location and requested immediate support for his team. In his final act of bravery, he continued to engage the enemy until he was mortally wounded, gallantly giving his life for his country and for the cause of freedom. By his selfless leadership, courageous actions, and extraordinary devotion to duty, Lieutenant Murphy reflected great credit upon himself and upheld the highest traditions of the United States Naval Service.

In light of the ongoing problems and diminished capacity of the U.S. space program one must ask the question; if the U.S. did not have these problems, would a satellite system have been fielded that would have allowed LT Murphy to contact his headquarters without exposing himself to enemy fire? The U.S. government must recognize the implications of weak and ineffectual policy and it must act quickly to correct them. Lives may very well depend on it.

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